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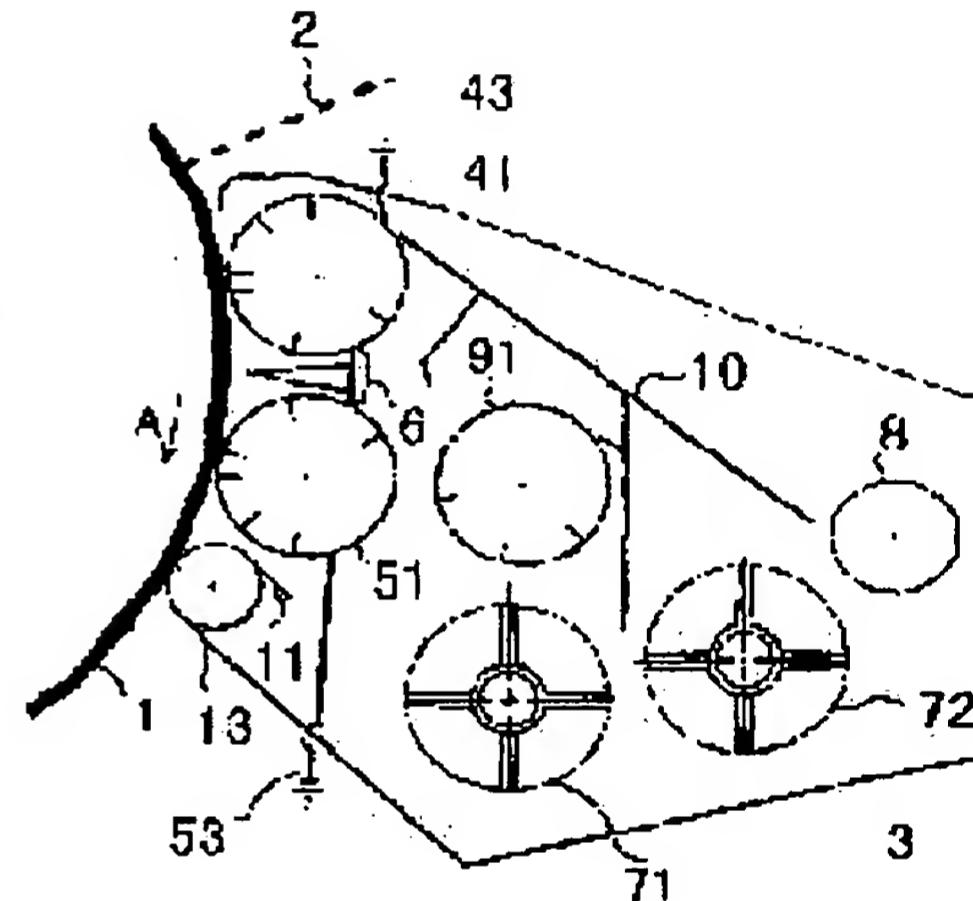
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(54) ELECTROPHOTOGRAPHIC EQUIPMENT

(57) Abstract:

PROBLEM TO BE SOLVED: To obtain a uniform image by matching a position of a recording medium and two developing rollers, a kind of a magnetic pole in a development and the position of a doctor blade.

SOLUTION: This equipment comprises with the two developing rollers mutually rotating in opposite directions being used, the rotating direction of the first developing roller is opposite to the direction of a photo conductor drum with an insulation distance of 0.5 mm-1.5 mm, the rotating direction of the second developing roller is identical to the direction of the photo conductor drum with the insulation distance of 0.5 mm-1.5 mm, the first and the second developing rollers are positioned 30 degrees respectively from a center of the photo conductor drum, a distance between the photoconductor drum and the doctor blade is 5 mm-15 mm, each of the first developing roller and the second developing roller has two magnetic poles in development respectively.



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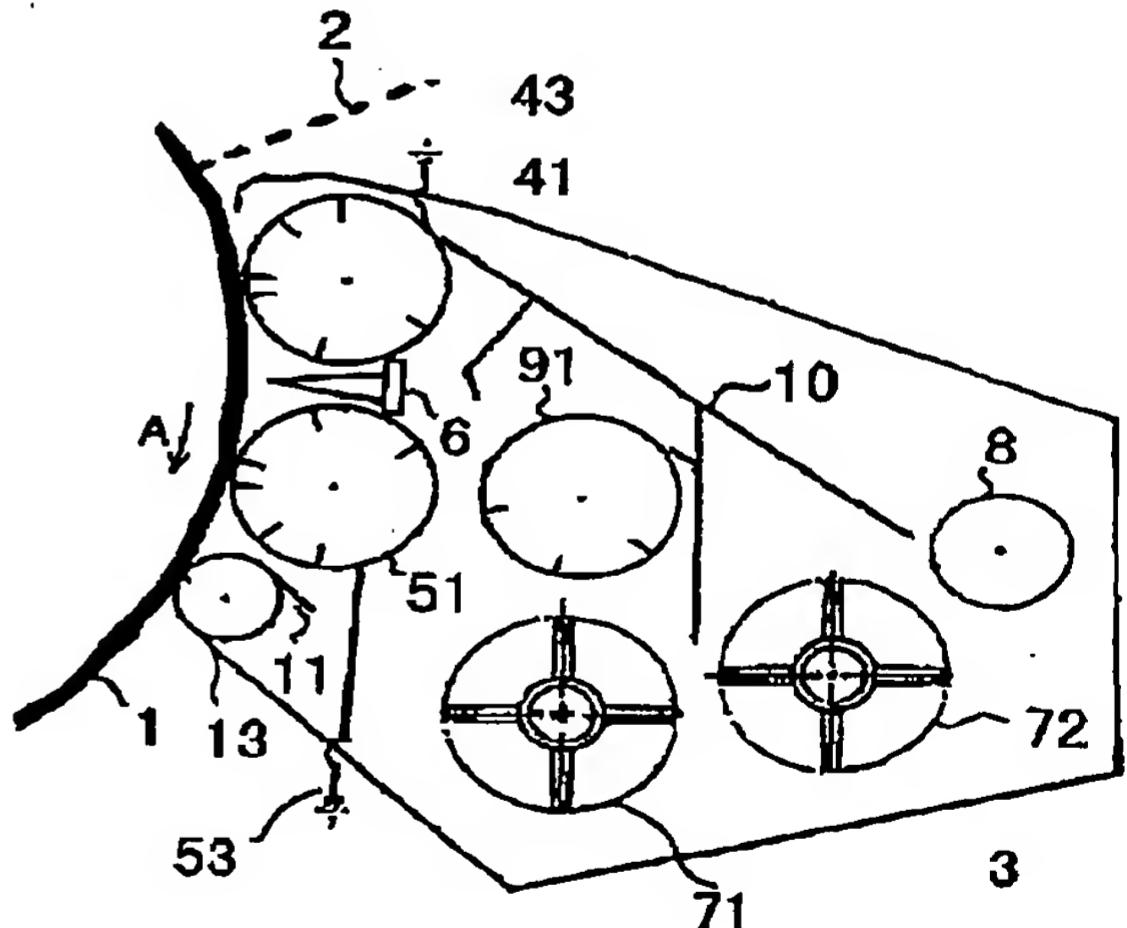
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(54)【発明の名称】電子写真装置

(57)【要約】

【課題】記録媒体と2本の現像ローラの位置及び現像磁極の種類、ドクターブレードとの位置を整合することにより、均一な画像を得る。

【解決手段】互いに逆方向に回転する2本の現像ローラを用い、第1現像ローラの移動方向が感光体ドラムの移動方向と逆方向であって、絶縁距離が0.5mm～1.5mmであり、第2現像ローラの移動方向が感光体ドラムの移動方向と同方向であって、絶縁距離が0.5mm～1.5mmであり、第1現像ローラ及び第2現像ローラが感光体ドラムの中心から30度の位置にあり、感光体ドラムとドクターブレードとの距離が5mm～15mmであり、第1現像ローラ及び第2現像ローラの現像磁極が2極ある。



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【特許請求の範囲】

【請求項1】 記録体に形成した静電電荷潜像を、その記録体の移動方向に沿って配置されて互いに逆方向に回転する第1現像ローラと第2現像ローラにより、磁性キャリアとトナーとを主成分とする2成分磁性現像剤で現像し、第1現像ローラの移動方向が前記記録体の移動方向と逆方向であって、第1現像ローラが光信号入射位置より、時間的により0.2秒以内の位置に有り、かつ前記第2現像ローラの移動方向が記録体の移動方向と同方向であって、第2現像ローラが入射位置より0.8秒以内の範囲に規制されていることを特徴とする電子写真装置において、

第1現像ローラ現像磁極を2磁極にしたことを特徴とする電子写真装置。

【請求項2】 第1現像ローラ現像磁極の2磁極のうち、第2現像ローラ側の磁力が他方よりも1~4/3の範囲に規制されていることを特徴とする請求項1記載の電子写真装置。

【請求項3】 第2現像ローラ現像磁極を2磁極にしたことを特徴とする請求項1記載の電子写真装置。

【請求項4】 第2現像ローラ現像磁極の2磁極のうち、第1現像ローラ側の磁力がキャッチローラ側の磁力よりも1~2/3の範囲に規制されていることを特徴とする請求項3記載の電子写真装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、電子写真法や静電記録法を用いて、着色トナー像を用紙等の転写材に形成する画像形成装置に係り、特に感光体や誘電体などの記録体に形成した静電電荷潜像を、その記録体の移動方向に沿って配置されて互いに逆方向に回転する第1現像ローラと第2現像ローラにより、磁性キャリアとトナーとを主成分とする2成分磁性現像剤で現像する電子写真装置に関する。

【0002】

【従来の技術】 従来、電子写真法や静電記録法において、記録体である光導電感光体や誘電体に電荷潜像を作り、これを互いに逆方向に回転する2本の現像ローラにより、磁性キャリアとトナーを主成分とする2成分磁性現像剤で現像する方式が、特公昭54-10869号公報、公表特開平1-503811号公報、実公昭63-15881号公報、米国特許明細書第4,442,790号等に開示されている。

【0003】

【発明が解決しようとする課題】 しかし従来のような方法では、画像濃度の階調特性や網点ないし線からなる画像写真印字において、中・低画像濃度域を重要視した場合には画像濃度が下がるという問題を残していた。本発明の目的は、前記課題の解決にある。

【0004】 図3は、従来の静電潜像現像装置において

て、しばしば見られる黒ベタ画像を説明するための図である。図3(イ)は縦横3cm程度の大きさの黒ベタ部33を高画像濃度で記録したもの、図3(ロ)はその断面図の一例である。黒ベタ部33の周辺部がエッジ効果によって高く盛り上がっている。図4は図3を記録した際の文字の例である。現像能力の高い高画像濃度においては、文字の線や点も、太く、大きくなる。これは複雑な漢字、等を印字した場合に文字細部の認識が困難になり、またトナー使用量が多くなる、印字部分が盛り上がり、製本文書の高品質を低下させる、等の欠点がある。

【0005】 図5は、低画像濃度で記録した黒ベタ画像を説明するための図である。図5(イ)は縦横3cm程度の大きさの黒ベタ部33を高画像濃度で記録したもの、図5(ロ)はその断面図の一例である。図3(イ)と比較した場合にべた黒の中央部が白くなる欠陥があり、図3(ロ)のように高く盛り上がってない。図6は図5を記録した際の文字の例である。図5のように黒ベタには欠陥が残るが、文字の線や点が、細く、小さくなり、細部の認識は可能になる。

【0006】 本発明者はこの画像欠陥について種々検討した結果、第1現像ローラと記録体とで形成される絶縁距離、第1現像ローラの中心と記録体の中心とで形成される角度、ならびに第2現像ローラと記録体とで形成される絶縁距離、第2現像ローラの中心と記録体の中心とで形成される角度大きく関与していることを見出した。本発明の目的は、上記従来技術の欠点を解消し、優れた画像品質が得られる画像形成装置を提供することにある。

【0007】

【課題を解決するための手段】 前記の課題を解決するための手段として、感光体や誘電体などの記録体に形成した静電電荷潜像を、その記録体の移動方向に沿って配置されて互いに逆方向に回転する第1現像ローラと第2現像ローラにより、磁性キャリアとトナーとを主成分とする2成分磁性現像剤で現像する画像形成装置によって達成する。

【0008】 本発明は、第1現像ローラが光信号より時間的に0.2秒以内の位置に有り、かつ前記第2現像ローラの移動方向が記録体の移動方向と同方向であって、第2現像ローラが当該光信号より時間的に0.8秒以内の範囲に規制されていることを特徴とするものである。更に、本発明の第2の手段は、前記第1の手段において、前記第1現像ローラ及び第2現像ローラが前記記録体の中心から30度(±15度)の位臵規制されていることを特徴とするものである。本発明の第3の手段は、前記第1の手段において、前記第1現像ローラと前記記録体との絶縁距離が0.5mm~1.5mmの範囲に規制されていることを特徴とするものである。本発明の第4の手段は、前記第1の手段において、前記第2現像ローラと前記記録体との

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絶縁距離が0.5mm～1.5mmの範囲に規制されていることを特徴とするものである。本発明の第5の手段は、前記第1の手段において、前記記録体とドクターブレードの距離を5mm～15mmの範囲に規制されていることを特徴とするものである。本発明の第6の手段は、前記第1の手段において、前記第1現像ローラの中心と前記記録体の中心とを結ぶ線に対する現像磁極の中心がなす角度 α は、回転手前0～10度の範囲に規制されていることを特徴とするものである。本発明の第7の手段は、前記第1の手段において、前記第2現像ローラの中心と前記記録体の中心とを結ぶ線に対する現像磁極の中心がなす角度 β は、回転手前0±10度の範囲に規制されていることを特徴とするものである。本発明の第8の手段は、前記第1の手段において、前記第1現像ローラと前記ドクターブレードとで形成される距離が0.5mm～1.5mmの範囲に規制されていることを特徴とするものである。本発明の第9の手段は、前記第1の手段において、前記ドクターブレードと前記第2現像ローラとで形成される距離が0.5mm～1.5mmの範囲に規制されていることを特徴とするものである。本発明の第10の手段は、前記第1の手段において、前記第1現像ローラの現像磁極を2磁極に設定されていることを特徴とするものである。本発明の第11の手段は、前記第1の手段において、前記第2現像ローラの現像磁極を2磁極に設定されていることを特徴とするものである。なお本発明の基本的構成は1成分現像剤においても十分通用するものである。

【0009】

【発明の実施の形態】本発明は、静電記録法や電子写真法において、記録体上に形成された静電電荷潜像を現像してトナー像を得る画像形成装置について述べる。

【0010】図1は、本発明の実施の形態に係るレーザプリンタの現像機周辺の構成図である。同図に示すように光導電性の感光体ドラム1は矢印A(時計回り)方向に回転する。その周囲に、レーザビーム(光書き込み系)2、現像器3、が配置されている。一様に帶電した感光体ドラム1はレーザビーム2で静電電荷潜像を形成する。感光体ドラム1の帶電極性はプラス、マイナス何れでも良いが、ここではマイナスとする。続いて現像器3で反転現像し、マイナス極性のトナー像を感光体ドラム1上に形成する。露光をバックグランドライティングとし正規現像しても良いが、本発明は反転現像の場合により効果を發揮する。

【0011】次に現像器3の動作について説明する。感光体ドラム1と逆方向に回転する第1現像ローラ41と、感光体ドラム1と同方向に回転する第2現像ローラ51とは、内部にそれぞれ固定されたマグネット42、マグネット52を有し、これらマグネット42、52の磁力により、それぞれの現像ローラ41、51に磁性キャリアと着色トナー(磁性もしくは非磁性)とを主成分とする2成分磁性現像剤を吸着し、さらに第1、第2現

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像ローラ41、51のそれぞれの回転により搬送し、現像剤を感光体ドラム1に接触せしめて電荷潜像を現像する。

【0012】感光体ドラム1の中心と第1、第2現像ローラ41、51の各中心とを結ぶ線に対する現像磁極の中心がなす角度 α 、 β は、第1現像ローラ41では時計回り0～10度に、第2現像ローラ51では±10度に設定されている。これはキャリア14及びトナー15より構成される現像剤が各現像ローラ表面で形成される磁気ブッシュと、感光体ドラム1に接触する際の抵抗を低く押さえるためである。トナーの帶電極性は感光体ドラム1の帶電極性と同極性のマイナスである。現像剤の搬送量は、ドクターブレード6と第1、第2現像ローラ41、51のギャップにより調整される。第1現像ローラ41とドクターブレード6とで形成される距離は0.5mm～1.5mmの範囲が望ましい。これは第1現像ローラ41とドクターブレード6とで形成される距離が短い場合、キャリア14及びトナー15より構成される現像剤の通過量が少なくなるために感光体ドラム1に接触できず、現像が十分に行えなくなる。第1現像ローラ41とドクターブレード6とで形成される距離が長い場合、キャリア14及びトナー15より構成される現像剤の通過量が多くなるので感光体ドラム1に十分接触できるが、感光体ドラム1と第1現像ローラ41とのあいだを現像剤が通過しきれずに滞り、第1現像ローラ41を駆動するモータへの負担が大きくなり、さらに駆動しなくなる、感光体ドラム1の表面をキャリア4が強くこすってしまい、感光体ドラム1を傷つけてしまうことが、実験により確認されたためである。そして第2現像ローラ51とドクターブレード8とで形成される距離は0.5mm～1.5mmの範囲が望ましい。これは先記と同様な実験を行い、確かめることが出来た。

【0013】第1現像ローラ41にバイアス電源43、第2現像ローラ51にバイアス電源53が接続されて、共にトナーと同極性のマイナスの電圧が印加される。この時感光体ドラム1と第1現像ローラ41とで形成される絶縁層の距離が短い場合には感光体の表面層を超えて放電現象を起こしてしまい、感光体ドラムの損傷、記録不可能となってしまう。また感光体ドラム1と第1現像ローラ41とで形成される絶縁層の距離は感光体材料(膜厚、誘電率、抵抗)や現像剤材料(粒径、粒子形状、誘電率、抵抗)により決まるものであるが、負帯電の有機感光体を利用した場合にはこの最適距離が長い場合には現像剤が感光体ドラム1と接触できず、現像が不十分となる。よってこの絶縁距離を0.5mm～1.5mmの範囲が最適であることが実験より確認された。同様に感光体ドラム1と第2現像ローラ51とで形成される絶縁層の距離は0.5mm～1.5mmの範囲が最適であることが実験より確認された。これらの絶縁距離の範囲は現像剤の流れを円滑にするためにも有効である現像器3内の現像剤は、

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切欠き羽根構造の一対のスクリューオーガ71, 72にて左右、前後に混合搅拌される。この混合搅拌に対して切欠き羽根構造のスクリューオーガ71, 72は、単純形状のスクリューオーガに比べてトナーを現像剤中に混合分散、帶電せしめる効果が大きい。従ってトナーをフィードローラ8から供給した際、速やかにトナーを現像剤中に分散せしめ、所定の帶電量にまで短時間で立ち上げることができるので、トナー補給時のかぶりや不均一現像の発生を防止できる。

【0014】斯くして混合搅拌された現像剤は内部に固定されたマグネット92をもつ搬送ローラ91に吸着、搬送され、ドクターブレード6と第2現像ローラ51とのギャップを通過した現像剤が、第2現像ローラ51での電荷潜像の現像を行い、現像器3内に戻される。ドクターブレード6で規制された現像剤は第2現像ローラ51側に向かい吸着、搬送され、ドクターブレード6と第1現像ローラ41とのギャップを通過した現像剤が、第1現像ローラ41での電荷潜像の現像を行い、スクリーペ10を経て現像器3内に戻される。第2現像ローラ部で規制された余剰の現像剤はガイド板11にてスクリューオーガ部に戻される。第1、第2現像ローラ41, 51での現像の際、感光体ドラム1上にトナーのみならず、キャリアが付着することがあるが、これを固定されたマグネット12を内蔵するキャッチローラ13にて引き戻し、その回転で現像器3内へ搬送、回収する。現像器3の設定位置は図1に示すように、感光体ドラム1の中心を軸とし、2つの現像ローラ41, 51の中心位置とでなす角度を30度（プラスマイナス15度）に設定すると、空間を効率よく使用でき、全体をコンパクトにまとめることができる。これ以上に大きくすると、感光体電位の暗減衰の影響を受け、画質が低下し、これ以下に設定すると、第1現像ロールと第2現像ロールの現像剤搬送の低下を起こし、空間配置が困難になる。現像ローラの現像磁極に吸着したキャリア14及びトナー15からなる現像剤は図2に示すように2本のブラシのように形成される。第1現像ローラ41の場合においては現像磁極の2磁極のうち、第2現像ローラ側の磁力、すなわちドクターブレード6より排出された現像剤が現像磁極に最初に吸着する磁極のあとに吸着する磁極の磁力よりも1～4/3の範囲に規制することにより現像剤の流れが円滑になる。この規制された磁力と逆にした場合、現像剤が第1現像ローラ41の2磁極間で円滑に渡すことが不可能となり、現像剤が感光体ドラム1と第1現像ローラ41で形成された空間の中で滞留し、その後に感光体ドラム1や現像ローラが駆動しなくなつたためである。第2現像ローラ51の場合においては現像磁極の2磁極のうち、第1現像ローラ41側の磁力すなわちドクターブレード6より排出された現像剤が現像磁極に最初に吸着する磁

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極の磁力がキャッチローラ側の磁力、すなわちドクターブレード6より排出された現像剤が現像磁極に最初に吸着する磁極のあとに吸着する磁極の磁力よりも1～2/3の範囲に規制することにより現像剤の流れが円滑になる。この規制された磁力と逆にすると、現像剤が第2現像ローラ51の2磁極間で円滑に渡すことが不可能となり、現像剤が感光体ドラム1と第2現像ローラ51で形成された空間の中で滞留し、その後に感光体ドラム1や現像ロールが駆動しなくなることがわかつた。

【0015】本発明を適用したレーザプリンタは、直径60～100mmの感光体ドラム1を用いた小形プリンタながら、記録速度20～40cm/sと高速で、かつ低画像濃度から高画像濃度に至るまで現像方向むらのない均一画像が得られる、中間調の均一再現性に優れた画像をプリントできる。

【0016】

【発明の効果】本発明は前述のように、互いに逆方向に回転する2本の現像ローラを用い、第1現像ローラ及び第2現像ローラが記録体の中心から30度（±15度）の位置にあり、第1現像ローラの移動方向が記録体の移動方向と逆方向であつて、第1現像ローラの現像磁極を2極に増やし、第1現像ローラと記録体との絶縁距離を0.5mm～1.5mmの範囲に規制し、第1現像ローラとドクターブレードとの距離を0.5mm～1.5mmの範囲に規制し、第2現像ローラの移動方向が記録体の移動方向と同方向であつて、第1現像ローラの現像磁極を2極に増やし、第2現像ローラと記録体との絶縁距離を0.5mm～1.5mmの範囲に規制し、第2現像ローラとドクターブレードとの距離を0.5mm～1.5mmの範囲に規制し、記録体とドクターブレードとの距離を5mm～15mmの範囲に規制することにより、優れた画像品質が得られる画像形成装置を提供が可能となる。

【図面の簡単な説明】

【図1】 本発明の実施の形態に係る現像器周辺の構成図である。

【図2】 本発明の実施の形態に係る現像ロール及び現像磁極に吸着した現像剤を示す図である。

【図3】 そのレーザプリンタにおいて高現像領域で記録した際の黒ベタを示す図である。

【図4】 そのレーザプリンタにおいて高現像領域で記録した際の文字を示す図である。

【図5】 そのレーザプリンタにおいて低現像領域で記録した際の黒ベタを示す図である。

【図6】 そのレーザプリンタにおいて低現像領域で記録した際の文字を示す図である。

【符号の説明】

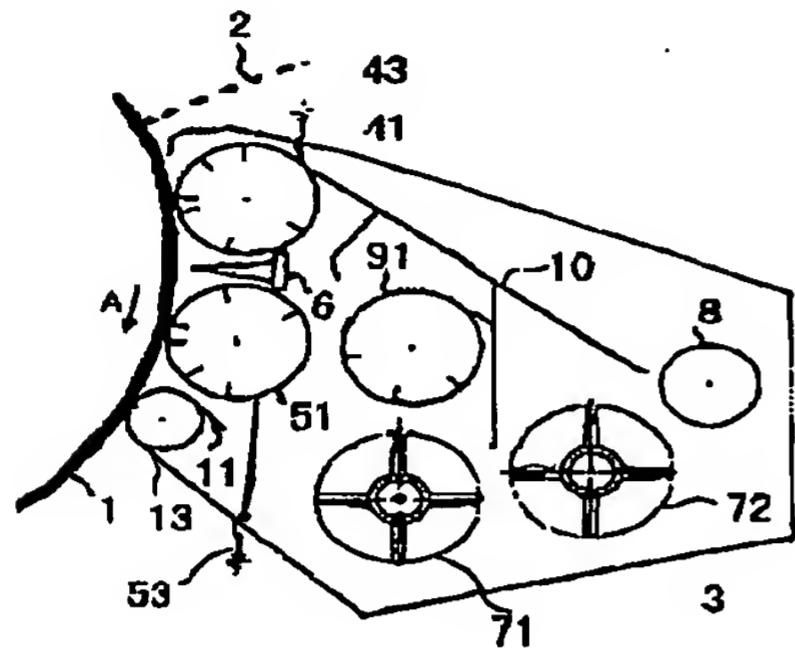
1…感光体ドラム、2…レーザビーム、3…現像器、4…第1現像ローラ、51…第2現像ローラ、6…ドクターブレード、71, 72…スクリューオーガ、8…フィードローラ、91…搬送ローラ、10…スクリーペ、

特開2001-305853 (P2001-305853A)

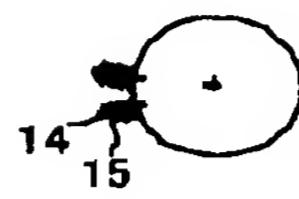
(5)

11…ガイド板、13…キャッチローラ、14…キャリ
ア、15…トナー、16…黒ベタ部

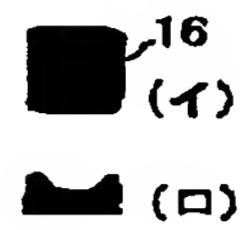
【図1】



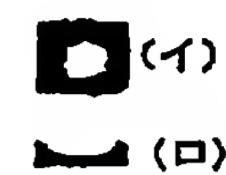
【図2】



【図3】



【図4】



【図6】



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CLAIMS

[Claim(s)]

[Claim 1] The electrostatic latent charge image formed in the record object with the 1st developing roller and the 2nd developing roller which are arranged along the migration direction of the record object, and rotate to hard flow mutually. A magnetic carrier and a toner are developed with 2 component magnetism developer used as a principal component. The migration direction of the 1st developing roller is the migration direction and hard flow of said record object. The 1st developing roller is in the location for less than 0.2 seconds more in time than a lightwave signal incidence location. And electrophotography equipment characterized by using the 1st developing-roller development magnetic pole as two magnetic poles in the electrophotography equipment which the migration direction of said 2nd developing roller is the migration direction and this direction of a record object, and is characterized by the 2nd developing roller being regulated from the incidence location by the range for less than 0.8 seconds.

[Claim 2] Electrophotography equipment according to claim 1 characterized by the magnetism by the side of the 2nd developing roller being regulated rather than another side among 2 of the 1st developing-roller development magnetic pole magnetic poles by the range of 1 - 4/3.

[Claim 3] Electrophotography equipment according to claim 1 characterized by using the 2nd developing-roller development magnetic pole as two magnetic poles.

[Claim 4] Electrophotography equipment according to claim 3 characterized by the magnetism by the side of the 1st developing roller being regulated rather than the magnetism by the side of a catch roll among 2 of the 2nd developing-roller development magnetic pole magnetic poles by the range of 1 - 2/3.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the electrophotography equipment which develops a magnetic carrier and a toner with 2 component magnetism developer used as a principal component with the 1st developing roller which is arranged along the migration direction of the record object, and rotates mutually the electrostatic latent charge image which was built over the image-formation equipment which forms a coloring toner image in imprint material, such as form, using the xerography or the electrostatic-recording method, especially was formed in record objects, such as a photo conductor and a dielectric, to hard flow, and the 2nd developing roller.

[0002]

[Description of the Prior Art] The method which develops a magnetic carrier and a toner with 2 component magnetism developer used as a principal component with two developing rollers which make a latent charge image in a xerograph or an electrostatic recording method conventionally to the photoconduction photo conductor and dielectric which are a record object, and rotate this to hard flow mutually is JP,54-10869,B, announcement JP,1-503811,A, JP,63-15881,Y, and *****. It is indicated by No. 4,442,790 etc.

[0003]

[Problem(s) to be Solved by the Invention] However, by approach like before, in image photograph printing which consists of the gradation property, halftone dot, or line of image concentration, when importance was attached to inside and a low image concentration region, it had left the problem that image concentration fell. The object of this invention is in solution of said technical problem.

[0004] Drawing 3 is drawing for explaining the black solid image often seen in the conventional electrostatic latent-image developer. The thing and drawing 3 (b) on which drawing 3 (b) recorded the black solid section 33 of the magnitude of about 3cm of every direction by high image concentration are an example of the sectional view. The periphery of the black solid section 33 is rising highly according to the edge effect. Drawing 4 is the example of the alphabetic character at the time of recording drawing 3 . In the high high image concentration of development capacity the line and point of an alphabetic character also become thickly and large. When the complicated kanji etc. is printed, recognition of alphabetic character details becomes difficult, and the printing part more than which the amount of the toner used increases rises, and this has the fault of ** in which the Takashina worth of a bookbinding document is reduced.

[0005] Drawing 5 is drawing for explaining the black solid image recorded by low image concentration. Thing drawing 5 (b) on which drawing 5 (b) recorded the black solid section 33 of the magnitude of about 3cm of every direction by high image concentration is an example of the sectional view. There is a defect to which the center section of poor black becomes white in comparison with drawing 3 (b), and it is not rising highly like drawing 3 (b). Drawing 6 is the example of the alphabetic character at the time of recording drawing 5 . Although a defect remains in black solid like drawing 5 , the line and point of an alphabetic character become thinly and small, and recognition of details is attained

[0006] the include angle formed at the core of the distance for insulation formed with the 1st developing roller and a record object, the include angle formed at the core of the 1st developing roller, and the core of a record object and the distance for insulation formed with the 2nd developing roller and a record object, and the 2nd developing roller, and the core of a record object as a result of this invention persons' examining many things about this image defect -- it found out involving greatly. The object of this invention is to offer the image formation equipment with which the fault of the above-mentioned conventional technique is canceled, and the outstanding image quality is acquired.

[0007]

[Means for Solving the Problem] The image formation equipment which develops a magnetic carrier and a toner with

component magnetism developer used as a principal component with the 1st developing roller which is arranged along the migration direction of the record object, and rotates mutually the electrostatic latent charge image formed in record objects, such as a photo conductor and a dielectric, to hard flow as aforementioned. The means for solving a technical problem, and the 2nd developing roller attains.

[0008] This invention is characterized by for the 1st developing roller being in the location for less than 0.2 seconds in time than a lightwave signal, and for the migration direction of said 2nd developing roller being the migration direction and this direction of a record object, and the 2nd developing roller being regulated by the range for less than 0.8 seconds in time than the lightwave signal concerned. Furthermore, in said 1st means, as for the 2nd means of this invention, said 1st developing roller and 2nd developing roller are characterized by 30 things (**15 degrees) done for location regulation from the core of said record object. The 3rd means of this invention is characterized by being regulated by the range whose distance for insulation of said 1st developing roller and said record object is 0.5mm - 1.5mm in said 1st means. The 4th means of this invention is characterized by being regulated by the range whose distance for insulation of said 2nd developing roller and said record object is 0.5mm - 1.5mm in said 1st means. The 5th means of this invention is characterized by the range of 5mm - 15mm regulating the distance of said record object and doctor blade in said 1st means. It is characterized by the include angle alpha at which the core of a development magnetic pole over the line which connects the core of said 1st developing roller and the core of said record object makes the 6th means of this invention in said 1st means being regulated by the range of zero - ten revolution this side. It is characterized by the include angle beta at which the core of a development magnetic pole over the line which connects the core of said 2nd developing roller and the core of said record object makes the 7th means of this invention in said 1st means being regulated by the range of 0**10 revolution this side. The 8th means of this invention is characterized by being regulated by the range whose distance formed with said 1st developing roller and said doctor blade is 0.5mm - 1.5mm in said 1st means. The 9th means of this invention is characterized by being regulated by the range whose distance formed with said doctor blade and said 2nd developing roller is 0.5mm - 1.5mm in said 1st means. The 10th means of this invention is characterized by setting the development magnetic pole of said 1st developing roller as two magnetic poles in said 1st means. The 11th means of this invention is characterized by setting the development magnetic pole of said 2nd developing roller as two magnetic poles in said 1st means. In addition, the fundamental configuration of this invention is enough accepted also in 1 component developer.

[0009]

[Embodiment of the Invention] This invention describes the image formation equipment which develops the electrostatic latent charge image formed on the record object, and obtains a toner image in an electrostatic recording method or a xerography.

[0010] Drawing 1 is the block diagram of the developing-machine circumference of the laser beam printer concerning the gestalt of operation of this invention. As shown in this drawing, the photo conductor drum 1 of a photoconductivity rotates in the direction of arrow-head A (clockwise rotation). To the perimeter, a laser beam (system write-in [optical]) 2 and development counter 3** are arranged. The photo conductor drum 1 charged uniformly forms an electrostatic latent charge image by the laser beam 2. the electrification polarity of the photo conductor drum 1 -- plus and minus -- although any are sufficient, it considers as minus here. Then, reversal development is carried out with a development counter 3, and the toner image of a minus polarity is formed on the photo conductor drum 1. Exposure is made into a background lighting, and although normal development may be carried out, this invention demonstrates effectiveness by the case of reversal development.

[0011] Next, actuation of a development counter 3 is explained. The photo conductor drum 1, the 1st developing roller 41 which rotates to hard flow, and the photo conductor drum 1 and the 2nd developing roller 51 which rotates in this direction It has the magnet 42 and magnet 52 which were fixed to the interior, respectively. By the magnetism of these magnets 42 and 52 2 component magnetism developer which uses a magnetic carrier and a coloring toner (magnetism or nonmagnetic) as a principal component at each developing roller 41 and 51 is adsorbed. Furthermore, convey by each revolution of the 1st and 2nd developing roller 41 and 51, a developer is made to contact the photo conductor drum 1, and a latent charge image is developed.

[0012] The include angles alpha and beta which the core of a development magnetic pole over the line which connects the core of the photo conductor drum 1 and each core of the 1st and 2nd developing roller 41 and 51 makes are set as zero - ten clockwise rotations with the 1st developing roller 41, and are set as **10 degrees with the 2nd developing roller 51. This is for pressing down low the magnetic brush with which the developer which consists of a carrier 14 an a toner 15 is formed on each developing-roller front face, and the resistance at the time of contacting the photo conductor drum 1. The electrification polarity of a toner is minus of the electrification polarity of the photo conductor drum 1, and like-pole nature. The amount of conveyances of a developer is adjusted by the gap of a doctor blade 6 and

the 1st and 2nd developing roller 41 and 51. The distance formed with the 1st developing roller 41 and a doctor blade has the desirable range of 0.5mm - 1.5mm. When the distance formed with the 1st developing roller 41 and a doctor blade 6 is short, it becomes impossible for this to contact the photo conductor drum 1, since the through put of the developer which consists of a carrier 14 and a toner 15 decreases, but to fully develop it. Although the photo conductor drum 1 can be enough contacted since the through put of the developer which consists of a carrier 14 and a toner 15 increases when the distance formed with the 1st developing roller 41 and a doctor blade 6 is long. Are overdue, without the ability of a developer passing through between the photo conductor drum 1 and the 1st developing roller 41. It is because it was checked by experiment for the burden to the motor which drives the 1st developing roller 41 to become large, and for a carrier 4 to rub strongly the front face of the photo conductor drum 1 no longer driving further, and to damage the photo conductor drum 1. And the distance formed with the 2nd developing roller 51 and a doctor blade 6 has the desirable range of 0.5mm - 1.5mm. This was able to be confirmed by conducting the same experiment as the account of the point.

[0013] Bias power supply 43 is connected to the 1st developing roller 41, bias power supply 53 is connected to the 2nd developing roller 51, and the electrical potential difference of minus of a toner and like-pole nature is both impressed. When the distance of the insulating layer formed with the photo conductor drum 1 and the 1st developing roller 41 at this time is short, a discharge phenomenon will be caused exceeding the surface layer of a photo conductor, and it will become breakage on a photo conductor drum, and unrecordable. Moreover, although the distance of the insulating layer formed with the photo conductor drum 1 and the 1st developing roller 41 is decided with a photo conductor ingredient (thickness, a dielectric constant, resistance) or a developer ingredient (particle size, particle shape, a dielectric constant, resistance), when the organic photo conductor of negative electrification is used and this optimal distance is long, a developer cannot contact the photo conductor drum 1, but development serves as imperfection. Therefore, it was checked from the experiment in this distance for insulation that the range of 0.5mm - 1.5mm is the optimal. It was checked from the experiment that the distance of the insulating layer similarly formed with the photo conductor drum and the 2nd developing roller 51 has the optimal range of 0.5mm - 1.5mm. Mixed churning of the developer in the development counter 3 effective also in order for the range of these distance for insulation to make flow of a developer smooth is carried out with the screw augers 71 and 72 of the couple of notch wing structure in right and left and order. The effectiveness of comparing the screw augers 71 and 72 of notch wing structure with the screw auger of a simple configuration, mixing-distributing and making it a toner charged in a developer to this mixed churning is large. Therefore, since a toner is made to be able to distribute in a developer promptly and it can rise even in the predetermined amount of electrifications in a short time when a toner is supplied from a feed roller 8, the fogging at the time of toner makeup and generating of ununiformity development can be prevented.

[0014] The conveyance roller 91 with the magnet 92 fixed to the interior is adsorbed, the developer by which mixed churning was carried out thus is conveyed, and the developer which passed the gap of a doctor blade 6 and the 2nd developing roller 51 develops the latent charge image in the 2nd developing roller 51, and is returned in a development counter 3. The developer regulated with the doctor blade 6 goes to the 2nd developing-roller 51 side, and it is adsorbed and conveyed, and the developer which passed the gap of a doctor blade 6 and the 1st developing roller 41 develops the latent charge image in the 1st developing roller 41, and is returned in a development counter 3 through a scraper 10. The developer of the surplus regulated in the 2nd developing-roller section is returned to the screw auger section by the guide plate 11. Although not only a toner but a carrier may adhere on the photo conductor drum 1 in the case of the development in the 1st and 2nd developing roller 41 and 51, it pulls back with the catch roller 13 having the magnet 12 which had this fixed, and conveys and collects into a development counter 3 by the revolution. If the include angle made centering on the core of the photo conductor drum 1 in the center position of two developing rollers 41 and 51 is set as 30 degrees (15 double signs) as shown in drawing 1, the setting-out location of a development counter 3 can use space efficiently, and can summarize the whole in a compact. If it will be influenced of the dark decay of photo conductor potential, and image quality will deteriorate, if it is made larger than this, and it is set as less than [this], a lifting and a spacial configuration will become difficult about lowering of developer conveyance of the 1st development roll and the 2nd development roll. The developer which consists of the carrier 14 and toner 15 which stuck to the development magnetic pole of a developing roller is formed like two brushes, as shown in drawing 2. In the case of the 1st developing roller 41, the flow of a developer becomes smooth among 2 of a development magnetic pole magnetic poles by regulating at the range of 1 - 4/3 rather than the magnetism of the magnetic pole to which the developer discharged from the magnetism 6 by the side of the 2nd developing roller, i.e., a doctor blade, sticks after the magnetic pole by which the developer with which the magnetism of a magnetic pole to which it sticks first at a development magnetic pole was discharged from another side 6, i.e., a doctor blade, sticks to a development magnetic pole first. When it is made this magnetism and reverse that were regulated, it is because the developer became

impossible [passing smoothly among 2 magnetic poles of the 1st developing roller 41], it piled up in the space in which the developer was formed with the photo conductor drum 1 and the 1st developing roller 41 and the photo conductor drum 1 and the developing roller stopped driving after that. The magnetism of the magnetic pole by which the developer which was discharged among 2 of a development magnetic pole magnetic poles in the case of the 2nd developing roller 51, the magnetism 6, i.e., the doctor blade, by the side of the 1st developing roller 41, sticks to a development magnetic pole first. The magnetism by the side of a catch roll, That is, the flow of a developer becomes smooth when the developer discharged from the doctor blade 6 regulates in the range of 1 - 2/3 rather than the magnetism of the magnetic pole which adsorbs after the magnetic pole which sticks to a development magnetic pole first. When it was made this magnetism and reverse that were regulated, it understood that a developer becomes impossible [passing smoothly among 2 magnetic poles of the 2nd developing roller 51], pile up in the space in which the developer was formed with the photo conductor drum 1 and the 2nd developing roller 51, and the photo conductor drum 1 and a development roll stop driving after that.

[0015] The laser beam printer which applied this invention can print the image which are a recording rate 20 - 40 cm/s and a high speed with the small printer which used the photo conductor drum 1 with a diameter of 60-100mm, and was excellent in the homogeneity repeatability of halftone from which the homogeneity image which does not have the development direction unevenness until it results [from low image concentration] in high image concentration is obtained.

[0016]

[Effect of the Invention] This invention uses two developing rollers which rotate to hard flow mutually as mentioned above. The 1st developing roller and the 2nd developing roller are in the location of 30 degrees (**15 degrees) from the core of a record object. The migration direction of the 1st developing roller is the migration direction and hard flow of record object, and the development magnetic pole of the 1st developing roller is increased to the two poles. The distance for insulation of the 1st developing roller and a record object is regulated in the range of 0.5mm - 1.5mm. The distance of the 1st developing roller and a doctor blade is regulated in the range of 0.5mm - 1.5mm. The migration direction of the 2nd developing roller is the migration direction and this direction of a record object, and the development magnetic pole of the 1st developing roller is increased to the two poles. The distance for insulation of the 2nd developing roller and a record object is regulated in the range of 0.5mm - 1.5mm. Offer becomes possible about the image formation equipment with which the outstanding image quality is acquired by regulating the distance of the 2nd developing roller and a doctor blade in the range of 0.5mm - 1.5mm, and regulating the distance of a record object and a doctor blade in the range of 5mm - 15mm.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the electrophotography equipment which develops a magnetic carrier and a toner with 2 component magnetism developer used as a principal component with the 1st developing roller which is arranged along the migration direction of the record object, and rotates mutually the electrostatic latent charge image which was built over the image-formation equipment which forms a coloring toner image in imprint material, such as form, using the xerography or the electrostatic-recording method, especially was formed in record objects, such as a photo conductor and a dielectric, to hard flow, and the 2nd developing roller.

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PRIOR ART

[Description of the Prior Art] The method which develops a magnetic carrier and a toner with 2 component magnetism developer used as a principal component with two developing rollers which make a latent charge image in a xerograph or an electrostatic recording method conventionally to the photoconduction photo conductor and dielectric which are a record object, and rotate this to hard flow mutually is JP,54-10869,B, announcement JP,1-503811,A, JP,63-15881,Y, and *****. It is indicated by No. 4,442,790 etc.

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EFFECT OF THE INVENTION

[Effect of the Invention] This invention uses two developing rollers which rotate to hard flow mutually as mentioned above. The 1st developing roller and the 2nd developing roller are in the location of 30 degrees (**15 degrees) from the core of a record object. The migration direction of the 1st developing roller is the migration direction and hard flow of record object, and the development magnetic pole of the 1st developing roller is increased to the two poles. The distance for insulation of the 1st developing roller and a record object is regulated in the range of 0.5mm - 1.5mm. The distance of the 1st developing roller and a doctor blade is regulated in the range of 0.5mm - 1.5mm. The migration direction of the 2nd developing roller is the migration direction and this direction of a record object, and the development magnetic pole of the 1st developing roller is increased to the two poles. The distance for insulation of the 2nd developing roller and a record object is regulated in the range of 0.5mm - 1.5mm. Offer becomes possible about the image formation equipment with which the outstanding image quality is acquired by regulating the distance of the 2nd developing roller and a doctor blade in the range of 0.5mm - 1.5mm, and regulating the distance of a record object and a doctor blade in the range of 5mm - 15mm.

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TECHNICAL PROBLEM

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[0004] Drawing 3 is drawing for explaining the black solid image often seen in the conventional electrostatic latent-image developer. The thing and drawing 3 (b) on which drawing 3 (b) recorded the black solid section 33 of the magnitude of about 3cm of every direction by high image concentration are an example of the sectional view. The periphery of the black solid section 33 is rising highly according to the edge effect. Drawing 4 is the example of the alphabetic character at the time of recording drawing 3. In the high high image concentration of development capacity the line and point of an alphabetic character also become thickly and large. When the complicated kanji etc. is printed recognition of alphabetic character details becomes difficult, and the printing part more than which the amount of the toner used increases rises, and this has the fault of ** in which the Takashina worth of a bookbinding document is reduced.

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[0006] the include angle formed at the core of the distance for insulation formed with the 1st developing roller and a record object, the include angle formed at the core of the 1st developing roller, and the core of a record object and the distance for insulation formed with the 2nd developing roller and a record object, and the 2nd developing roller, and the core of a record object as a result of this invention persons' examining many things about this image defect -- it found out involving greatly. The object of this invention is to offer the image formation equipment with which the fault of the above-mentioned conventional technique is canceled, and the outstanding image quality is acquired.

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MEANS

[Means for Solving the Problem] The image formation equipment which develops a magnetic carrier and a toner with component magnetism developer used as a principal component with the 1st developing roller which is arranged along the migration direction of the record object, and rotates mutually the electrostatic latent charge image formed in record objects, such as a photo conductor and a dielectric, to hard flow as aforementioned. The means for solving a technical problem, and the 2nd developing roller attains.

[0008] This invention is characterized by for the 1st developing roller being in the location for less than 0.2 seconds in time than a lightwave signal, and for the migration direction of said 2nd developing roller being the migration direction and this direction of a record object, and the 2nd developing roller being regulated by the range for less than 0.8 seconds in time than the lightwave signal concerned. Furthermore, in said 1st means, as for the 2nd means of this invention, said 1st developing roller and 2nd developing roller are characterized by 30 things (**15 degrees) done for location regulation from the core of said record object. The 3rd means of this invention is characterized by being regulated by the range whose distance for insulation of said 1st developing roller and said record object is 0.5mm - 1.5mm in said 1st means. The 4th means of this invention is characterized by being regulated by the range whose distance for insulation of said 2nd developing roller and said record object is 0.5mm - 1.5mm in said 1st means. The 5th means of this invention is characterized by the range of 5mm - 15mm regulating the distance of said record object and doctor blade in said 1st means. It is characterized by the include angle alpha at which the core of a development magnetic pole over the line which connects the core of said 1st developing roller and the core of said record object makes the 6th means of this invention in said 1st means being regulated by the range of zero - ten revolution this side. It is characterized by the include angle beta at which the core of a development magnetic pole over the line which connects the core of said 2nd developing roller and the core of said record object makes the 7th means of this invention in said 1st means being regulated by the range of 0**10 revolution this side. The 8th means of this invention is characterized by being regulated by the range whose distance formed with said 1st developing roller and said doctor blade is 0.5mm - 1.5mm in said 1st means. The 9th means of this invention is characterized by being regulated by the range whose distance formed with said doctor blade and said 2nd developing roller is 0.5mm - 1.5mm in said 1st means. The 10th means of this invention is characterized by setting the development magnetic pole of said 1st developing roller as two magnetic poles in said 1st means. The 11th means of this invention is characterized by setting the development magnetic pole of said 2nd developing roller as two magnetic poles in said 1st means. In addition, the fundamental configuration of this invention is enough accepted also in 1 component developer.

[0009]

[Embodiment of the Invention] This invention describes the image formation equipment which develops the electrostatic latent charge image formed on the record object, and obtains a toner image in an electrostatic recording method or a xerography.

[0010] Drawing 1 is the block diagram of the developing-machine circumference of the laser beam printer concerning the gestalt of operation of this invention. As shown in this drawing, the photo conductor drum 1 of a photoconductivity rotates in the direction of arrow-head A (clockwise rotation). To the perimeter, a laser beam (system write-in [optical]) 2 and development counter 3** are arranged. The photo conductor drum 1 charged uniformly forms an electrostatic latent charge image by the laser beam 2. the electrification polarity of the photo conductor drum 1 -- plus and minus -- although any are sufficient, it considers as minus here. Then, reversal development is carried out with a development counter 3, and the toner image of a minus polarity is formed on the photo conductor drum 1. Exposure is made into a background lighting, and although normal development may be carried out, this invention demonstrates effectiveness by the case of reversal development.

[0011] Next, actuation of a development counter 3 is explained. The photo conductor drum 1, the 1st developing roller

41 which rotates to hard flow, and the photo conductor drum 1 and the 2nd developing roller 51 which rotates in this direction It has the magnet 42 and magnet 52 which were fixed to the interior, respectively. By the magnetism of these magnets 42 and 52 2 component magnetism developer which uses a magnetic carrier and a coloring toner (magnetism or nonmagnetic) as a principal component at each developing roller 41 and 51 is adsorbed. Furthermore, convey by each revolution of the 1st and 2nd developing roller 41 and 51, a developer is made to contact the photo conductor drum 1, and a latent charge image is developed.

[0012] The include angles alpha and beta which the core of a development magnetic pole over the line which connects the core of the photo conductor drum 1 and each core of the 1st and 2nd developing roller 41 and 51 makes are set as zero - ten clockwise rotations with the 1st developing roller 41, and are set as **10 degrees with the 2nd developing roller 51. This is for pressing down low the magnetic brush with which the developer which consists of a carrier 14 an a toner 15 is formed on each developing-roller front face, and the resistance at the time of contacting the photo conductor drum 1. The electrification polarity of a toner is minus of the electrification polarity of the photo conductor drum 1, and like-pole nature. The amount of conveyances of a developer is adjusted by the gap of a doctor blade 6 and the 1st and 2nd developing roller 41 and 51. The distance formed with the 1st developing roller 41 and a doctor blade 6 has the desirable range of 0.5mm - 1.5mm. When the distance formed with the 1st developing roller 41 and a doctor blade 6 is short, it becomes impossible for this to contact the photo conductor drum 1, since the through put of the developer which consists of a carrier 14 and a toner 15 decreases, but to fully develop it. Although the photo conductor drum 1 can be enough contacted since the through put of the developer which consists of a carrier 14 and a toner 15 increases when the distance formed with the 1st developing roller 41 and a doctor blade 6 is long Are overdue, without the ability of a developer passing through between the photo conductor drum 1 and the 1st developing roller 41. It is because it was checked by experiment for the burden to the motor which drives the 1st developing roller 41 to become large, and for a carrier 4 to rub strongly the front face of the photo conductor drum 1 no longer driving further, and to damage the photo conductor drum 1. And the distance formed with the 2nd developing roller 51 and a doctor blade 6 has the desirable range of 0.5mm - 1.5mm. This was able to be confirmed by conducting the same experiment as the account of the point.

[0013] Bias power supply 43 is connected to the 1st developing roller 41, bias power supply 53 is connected to the 2nd developing roller 51, and the electrical potential difference of minus of a toner and like-pole nature is both impressed. When the distance of the insulating layer formed with the photo conductor drum 1 and the 1st developing roller 41 at this time is short, a discharge phenomenon will be caused exceeding the surface layer of a photo conductor, and it will become breakage on a photo conductor drum, and unrecordable. Moreover, although the distance of the insulating layer formed with the photo conductor drum 1 and the 1st developing roller 41 is decided with a photo conductor ingredient (thickness, a dielectric constant, resistance) or a developer ingredient (particle size, particle shape, a dielectric constant, resistance), when the organic photo conductor of negative electrification is used and this optimal distance is long, a developer cannot contact the photo conductor drum 1, but development serves as imperfection. Therefore, it was checked from the experiment in this distance for insulation that the range of 0.5mm - 1.5mm is the optimal. It was checked from the experiment that the distance of the insulating layer similarly formed with the photo conductor drum and the 2nd developing roller 51 has the optimal range of 0.5mm - 1.5mm. Mixed churning of the developer in the development counter 3 effective also in order for the range of these distance for insulation to make flow of a developer smooth is carried out with the screw augers 71 and 72 of the couple of notch wing structure in right and left and order. The effectiveness of comparing the screw augers 71 and 72 of notch wing structure with the screw auger of a simple configuration, mixing-distributing and making it a toner charged in a developer to this mixed churning is large. Therefore, since a toner is made to be able to distribute in a developer promptly and it can rise even in the predetermined amount of electrifications in a short time when a toner is supplied from a feed roller 8, the fogging at the time of toner makeup and generating of ununiformity development can be prevented.

[0014] The conveyance roller 91 with the magnet 92 fixed to the interior is adsorbed, the developer by which mixed churning was carried out thus is conveyed, and the developer which passed the gap of a doctor blade 6 and the 2nd developing roller 51 develops the latent charge image in the 2nd developing roller 51, and is returned in a development counter 3. The developer regulated with the doctor blade 6 goes to the 2nd developing-roller 51 side, and it is adsorbed and conveyed, and the developer which passed the gap of a doctor blade 6 and the 1st developing roller 41 develops the latent charge image in the 1st developing roller 41, and is returned in a development counter 3 through a scraper 10. The developer of the surplus regulated in the 2nd developing-roller section is returned to the screw auger section by the guide plate 11. Although not only a toner but a carrier may adhere on the photo conductor drum 1 in the case of the development in the 1st and 2nd developing roller 41 and 51, it pulls back with the catch roller 13 having the magnet 12 which had this fixed, and conveys and collects into a development counter 3 by the revolution. If the include angle

made centering on the core of the photo conductor drum 1 in the center position of two developing rollers 41 and 51 is set as 30 degrees (15 double signs) as shown in drawing 1, the setting-out location of a development counter 3 can use space efficiently, and can summarize the whole in a compact. If it will be influenced of the dark decay of photo conductor potential, and image quality will deteriorate, if it is made larger than this, and it is set as less than [this], a lifting and a spacial configuration will become difficult about lowering of developer conveyance of the 1st development roll and the 2nd development roll. The developer which consists of the carrier 14 and toner 15 which stuck to the development magnetic pole of a developing roller is formed like two brushes, as shown in drawing 2. In the case of the 1st developing roller 41, the flow of a developer becomes smooth among 2 of a development magnetic pole magnetic poles by regulating at the range of 1 - 4/3 rather than the magnetism of the magnetic pole to which the developer discharged from the magnetism 6 by the side of the 2nd developing roller, i.e., a doctor blade, sticks after the magnetic pole by which the developer with which the magnetism of a magnetic pole to which it sticks first at a development magnetic pole was discharged from another side 6, i.e., a doctor blade, sticks to a development magnetic pole first. When it is made this magnetism and reverse that were regulated, it is because the developer became impossible [passing smoothly among 2 magnetic poles of the 1st developing roller 41], it piled up in the space in which the developer was formed with the photo conductor drum 1 and the 1st developing roller 41 and the photo conductor drum 1 and the developing roller stopped driving after that. The magnetism of the magnetic pole by which the developer which was discharged among 2 of a development magnetic pole magnetic poles in the case of the 2nd developing roller 51, the magnetism 6, i.e., the doctor blade, by the side of the 1st developing roller 41, sticks to a development magnetic pole first. The magnetism by the side of a catch roll, That is, the flow of a developer becomes smooth when the developer discharged from the doctor blade 6 regulates in the range of 1 - 2/3 rather than the magnetism of the magnetic pole which adsorbs after the magnetic pole which sticks to a development magnetic pole first. When it was made this magnetism and reverse that were regulated, it understood that a developer becomes impossible [passing smoothly among 2 magnetic poles of the 2nd developing roller 51], pile up in the space in which the developer was formed with the photo conductor drum 1 and the 2nd developing roller 51, and the photo conductor drum 1 and a development roll stop driving after that.

[0015] The laser beam printer which applied this invention can print the image which are a recording rate 20 - 40 cm/s and a high speed with the small printer which used the photo conductor drum 1 with a diameter of 60-100mm, and was excellent in the homogeneity repeatability of halftone from which the homogeneity image which does not have the development direction unevenness until it results [from low image concentration] in high image concentration is obtained.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of the development counter circumference concerning the gestalt of operation of this invention.

[Drawing 2] It is drawing showing the developer which stuck to the development roll and development magnetic pole concerning the gestalt of operation of this invention.

[Drawing 3] It is drawing showing black solid at the time of recording in a high development field in the laser beam printer.

[Drawing 4] It is drawing showing the alphabetic character at the time of recording in a high development field in the laser beam printer.

[Drawing 5] It is drawing showing black solid at the time of recording in a low development field in the laser beam printer.

[Drawing 6] It is drawing showing the alphabetic character at the time of recording in a low development field in the laser beam printer.

[Description of Notations]

1 [-- The 1st developing roller, 51 / -- The 2nd developing roller, 6 / -- 71 A doctor blade, 72 / -- A screw auger, 8 / -- A feed roller, 91 / -- A conveyance roller, 10 / -- A scraper, 11 / -- A guide plate, 13 / -- A catch roller, 14 / -- A carrier, 15 / -- A toner, 16 / -- Black solid section.] -- A photo conductor drum, 2 -- A laser beam, 3 -- A development counter, 41

[Translation done.]

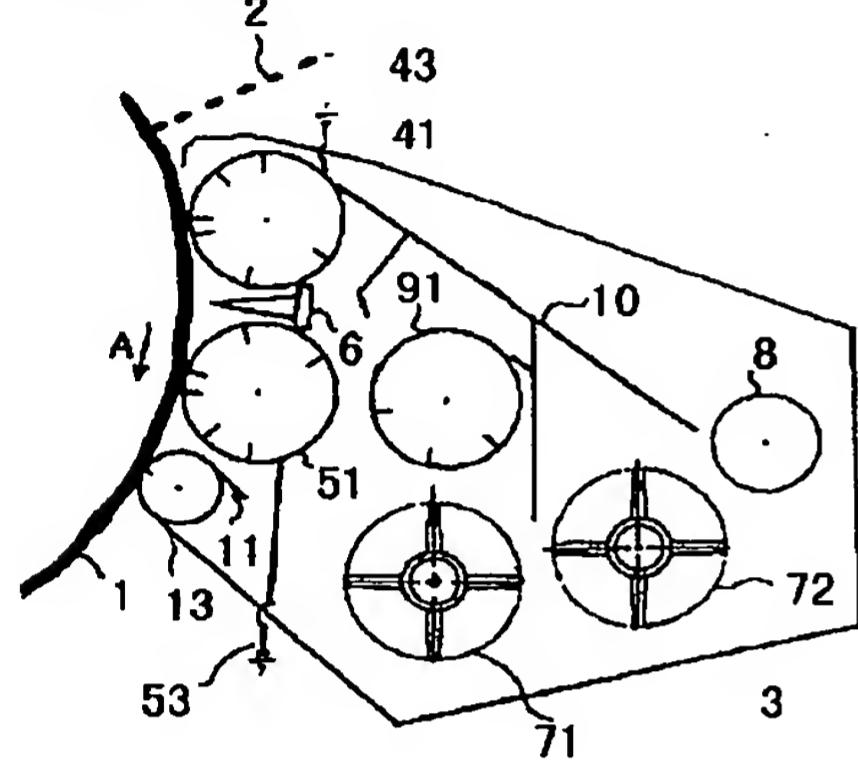
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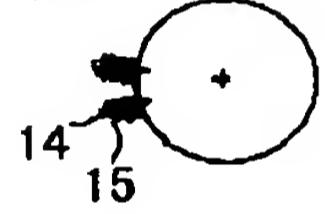
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DRAWINGS

[Drawing 1]



[Drawing 2]



[Drawing 3]



（□）

[Drawing 4]



[Drawing 5]



（□）

[Drawing 6]



[Translation done.]